

## 6.4a Exponential Growth and Decay

law of exponential change

If  $y$  changes at a rate proportional to the amount present

that is, if  $\frac{dy}{dt} = ky$  then  $y = y_0 e^{kt}$

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Suppose you deposit \$800 in an account that pays 6.3% annual interest compounded continuously. How much do you have 8 years later?

Find the doubling time.

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Radioactive decay and half-life

$$\frac{dy}{dt} = -ky \quad y = y_0 e^{-kt}$$

Find the half-life

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Choosing a convenient base

$$y = y_0 2^{\frac{t}{D}} \quad D = \text{Doubling Time}$$

$$y = y_0 \left(\frac{1}{2}\right)^{\frac{t}{H}} \quad H = \text{Half-life}$$

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The half-life of carbon 14 is about 5700 years. Find the age of a sample in which 10% of the radioactive nuclei originally present have decayed.

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Ex 4. At the beginning of the summer the population of a hive of wasps is growing at a rate proportional to the population. From a population of 10 on May 1, the number of hornets grows to 50 in 30 days. If the growth continues to follow the same model, how many days after May 1 will the population reach 100?

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